The XMM-Newton Slew Survey: Towards The Whole X-ray Sky and the Rarest X-ray Events

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Abstract.
The data collected by XMM-Newton as it slews between pointings currently cover almost half the entire sky, and many familiar features and new sources are visible. The soft-band sensitivity limit of the Slew is close to that of the RASS, and a large-area Slew-RASS comparison now provides the best opportunity for discovering extremely rare high-variability objects.

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TOWARDS THE WHOLE X-RAY SKY

The publicly available XMM-Newton slew data cover to date around 41% of the sky (see Fig. 1). The soft band (0.2−2 keV) sensitivity limit of the slews (6×10^{-13} ergs cm^{-2} s^{-1}) is close to that of the ROSAT All-Sky Survey (RASS), and in the medium (2−12 keV) band, the slew data goes significantly deeper (4×10^{-12} ergs cm^{-2} s^{-1}) than all other previous large area surveys. The current full catalogue (the third update, released in June 2009) contains 19,720 detections. For details on the construction and

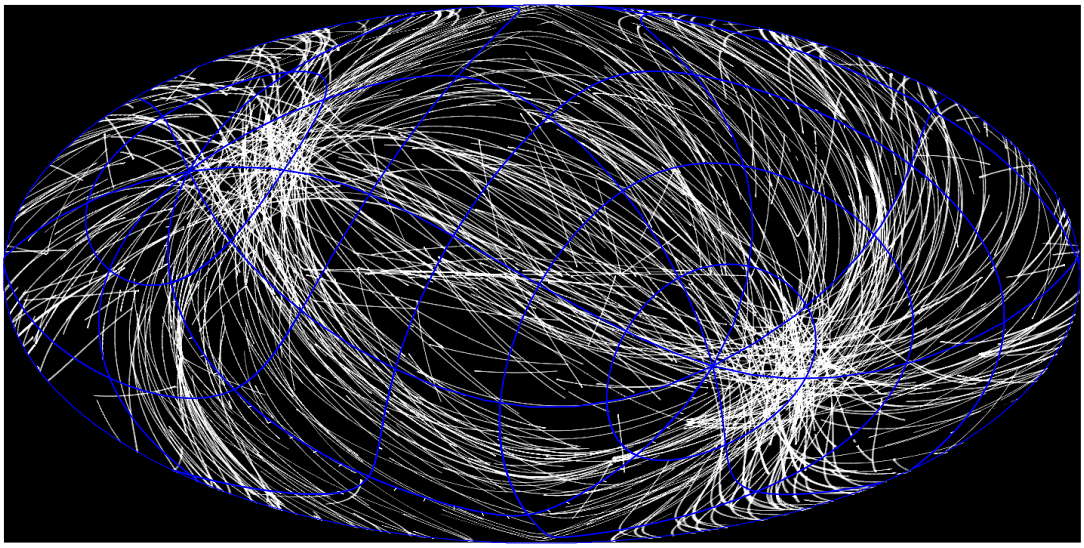

FIGURE 1. The full XMM-Newton slew exposure map (third catalogue update; June 2009), in a Galactic Aitoff co-ordinate projection. It covers ≈ 41% of the sky, with exposures ranging from just a few seconds at the slew path edges, up to close to a minute in the overlap regions near the Ecliptic poles.

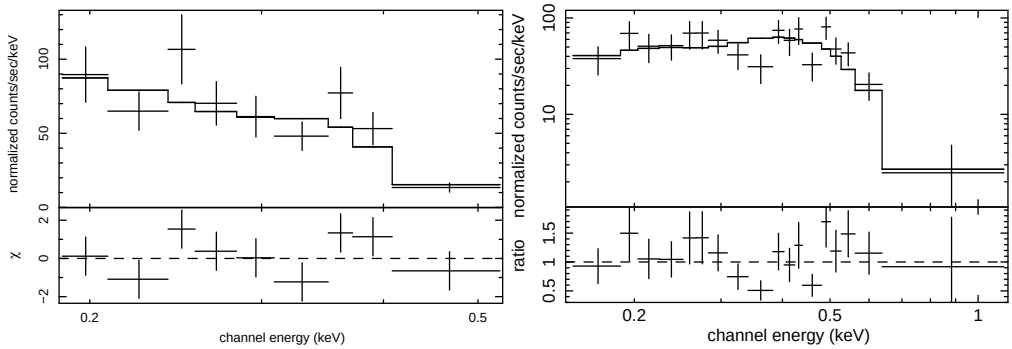

FIGURE 2. XMM-Newton slew EPIC-pn spectra of (left) XMMSL1 J070542.7-38144 and (right) XMMSL1 J060636.2-694933. Both are fitted with very low temperature black-body models.

characteristics of the XMM-Newton slew survey catalogue, see Saxton et al. (2008), and for details of the initial science results from the slew survey, see Read et al. (2006).

THE RAREST X-RAY EVENTS

The near real-time comparison of XMM-Newton slew data with RASS data is giving, for the first time, the opportunity of finding all manner of high-variability X-ray objects, e.g. tidal disruption candidates (Esquej et al. 2007, and this conference), AGN, blazars, and also Galactic sources such as novae, flare stars, cataclysmic variables, and eclipsing X-ray binaries. It is only with a large-area survey, such as the XMM-Newton Slew Survey, that such rare events have a chance of being caught. Two such high-variability sources we have classified as new classical novae. XMMSL1 J070542.7-381442 (Read et al. 2008), also known as V598 Pup, was seen in the slew to be $\sim$750 times brighter than the RASS upper limit. Our Magellan optical spectrum identified the source as an auroral phase nova, and the X-ray data indicates that the nova was in a super-soft state (see Fig. 2), and at a distance of $\sim$3 kpc. Analysis of archival optical ASAS data showed an incredibly bright (and at the time un-noticed) source, rising from $m_V \gtrsim 14$ to $m_V \approx 4.1$ over three days, making it one of the very brightest novae this decade. A second source, XMMSL1 J060636.2-694933 (Read et al. 2009), was seen in the slew to be $\gtrsim$500 times brighter than in the RASS, and XMM-Newton, Swift, Magellan and ASAS data were able to classify it as again an auroral phase, very fast nova in the super-soft state (Fig. 2), though at a much further distance and likely situated in the LMC. With discoveries such as these, it is clear that XMM-Newton slew data are continuing to offer a powerful opportunity to find new X-ray transient objects.

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